

TEST REPORT

Applicant : MAX CO., LTD.
Address : 1848 Kawai, Tamamura-machi, Sawa-gun, Gunma 370-1117 Japan
Products : Desktop Sign and Label Maker
Model No. : CPM-200GU
Serial No. : 16201106L
FCC ID : 2AH2G-CPM-200GU
Test Standard : CFR 47 FCC Rules and Regulations Part 15
Test Results : **Passed**
Date of Test : March 9 ~ 17, 2016



A handwritten signature in black ink, appearing to read 'K. Shibata', is positioned above a horizontal line.

Kousei Shibata
Manager
Japan Quality Assurance Organization
KITA-KANSAI Testing Center
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

-
- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan.
 - The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
 - The test results presented in this report relate only to the offered test sample.
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 - VLAC does not approve, certify or warrant the product by this test report.

TABLE OF CONTENTS

	Page
1 Description of the Equipment Under Test.....	3
2 Summary of Test Results	4
3 Test Procedure	5
4 Test Location.....	5
5 Recognition of Test Laboratory.....	5
6 Description of Test Setup	6
7 Test Requirements.....	8

DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT

EUT : Equipment Under Test

AE : Associated Equipment

N/A : Not Applicable

N/T : Not Tested

EMC : Electromagnetic Compatibility

EMI : Electromagnetic Interference

EMS : Electromagnetic Susceptibility

☒ - indicates that the listed condition, standard or equipment is applicable for this report.

☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

1 Description of the Equipment Under Test

1. Manufacturer : MAX CO., LTD.
1848 Kawai, Tamamura-machi, Sawa-gun, Gunma 370-1117 Japan
2. Products : Desktop Sign and Label Maker
3. Model No. : CPM-200GU
4. Serial No. : 16201106L
5. Product Type : Mass Production
6. Date of Manufacture : February, 2016
7. Power Rating : 100-240VAC 50/60Hz
8. Grounding : Grounded at the plug end of the power line
9. Transmitting Frequency : 13.56 MHz
10. Receiving Frequency : 13.56 MHz
11. Antenna Type : Integral PCB Antenna
12. EUT Authorization : Certification
13. Received Date of EUT : March 9, 2016

2 Summary of Test Results

Applied Standard : CFR 47 FCC Rules and Regulations Part 15
Subpart C – Intentional Radiators

The EUT described in clause 1 was tested according to the applied standard shown above.

Details of the test configuration is shown in clause 6.

The conclusion for the test items of which are required by the applied standard is indicated under the test result.

- ☒ - The test result was **passed** for the test requirements of the applied standard.
- ☐ - The test result was **failed** for the test requirements of the applied standard.
- ☐ - The test result was **not judged** the test requirements of the applied standard.

In the approval of test results,

- Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

Tested by:



Shigeru Osawa
Deputy Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch



Takeshi Choda
Assistant Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

3 Test Procedure

Test Requirements : §15.225, §15.207 and §15.209

Test Procedure : ANSI C63.10–2013
Testing unlicensed wireless devices.

4 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

5 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No. : VLAC-001-2 (Expiry date : March 30, 2016)
VCCI Registration No. : A-0002 (Expiry date : March 30, 2016)
BSMI Registration No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-R1/R2-E-6006, SL2-A1-E-6006
(Expiry date : September 14, 2016)
IC Registration No. : 2079E-3, 2079E-4 (Expiry date : July 16, 2017)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI.
(Expiry date : February 22, 2019)

6 Description of Test Setup

6.1 Test Configuration

The equipment under test (EUT) consists of :

	Item	Manufacturer	Model No.	Serial No.	FCC ID
A	Desktop Sign and Label Maker	Sharp	CPM-200GU	16201106L	2AH2G-CPM-200GU

The auxiliary equipment used for testing :

	Item	Manufacturer	Model No.	Serial No.	FCC ID
B *1)	Personal Computer	HP Compaq	HP6200P	JPA224LDJP	DoC
C *1)	LCD Monitor	HP Compaq	LE1711	3CQ205BH1K	--
D *1)	Keyboard	HP Compaq	KB-0316	BAUE00VB2N08Z	--
E *1)	Mouse	HP Compaq	M-U0031-O	FCGLF0DCW2QIF5	--

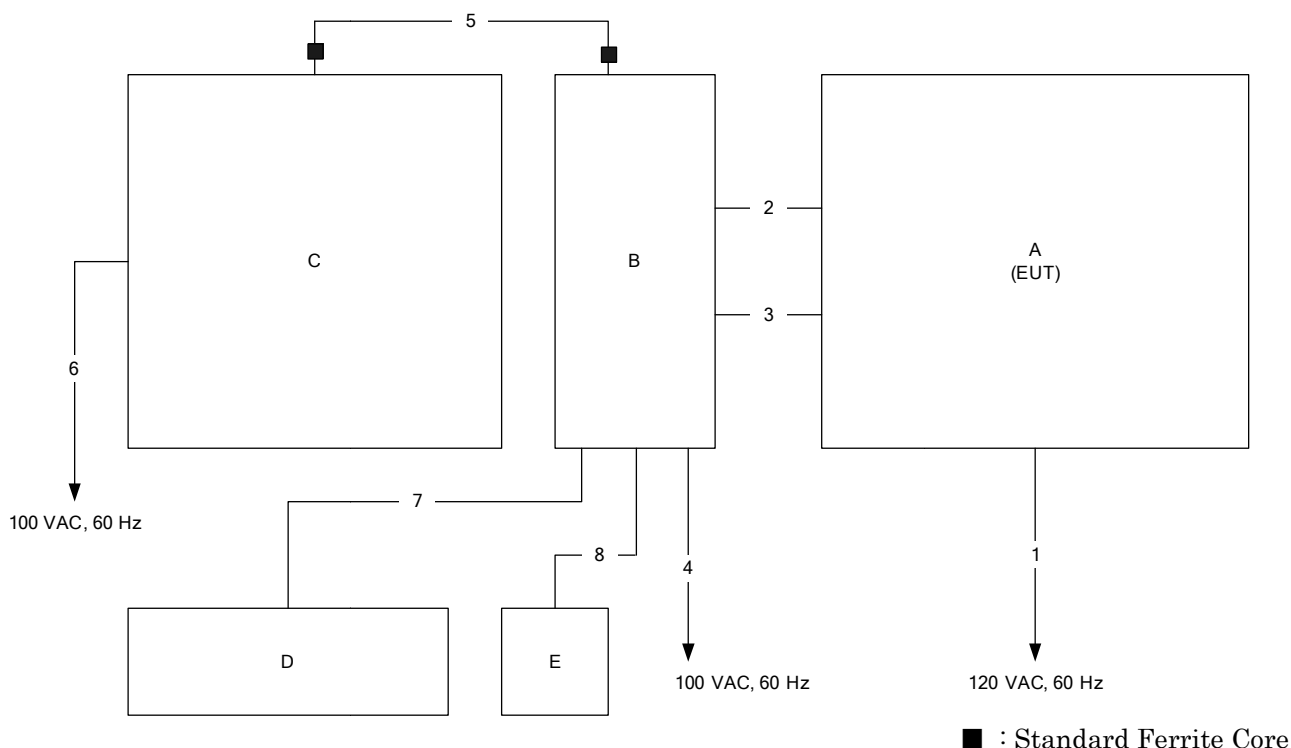
*1) Used for AC Powerline Conducted Emission test.

Type of Cable:

No.	Description	Identification (Manu. etc.)	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
1	AC Power Cable (3Pin)	-	No	No	No	1.8
2 *1)	USB Cable	-	Yes	Yes	No	1.8
3 *1)	LAN Cable	-	No	No	No	1.8
4 *1)	AC Power Cable (3Pin)	-	No	No	No	1.8
5 *1)	RGB Monitor Cable	-	Yes	Yes	Yes	1.8
6 *1)	AC Power Cable (3Pin)	-	No	No	No	1.8
7 *1)	Keyboard Cable	-	Yes	Yes	No	1.8
8 *1)	USB Cable	-	Yes	Yes	No	1.8

*1) Used for AC Powerline Conducted Emission test.

6.2 Test Arrangement (Drawings)



6.3 Operating Condition

Power Supply Voltage : 120 VAC 50/60Hz

Operation Mode :

The EUT is set with the test mode, the specification of the test mode is as TX mode(13.56MHz)

Used application to controlled :

The test mode is instructed by the applicant.

EUT with temporary antenna port was used in conducted measurement.

Detailed Transmitter portion:

Transmitter frequency : 13.560 MHz

Detailed Receiver portion:

Receiver frequency : 13.560 MHz

The test were carried out using the following test program supplied by applicant;

- Software Name: CPM200_app
- Software Version: 67.01
- Storage Location: EUT

7 Test Requirements

7.0 Summary of the Test Results

Test Item	FCC Specification	Reference of the Test Report	Results	Remarks
Antenna Requirement	Section 15.203	Section 1.11	Passed	-
AC Powerline Conducted Emission	Section 15.207	Section 7.1	Passed	-
Radiated Emission	Section 15.225(a)(b)(c)(d)	Section 7.2	Passed	-
Occupied Bandwidth	Section 15.215(c)	Section 7.3	Passed	-
Frequency Stability	Section 15.225(e)	Section 7.4	Passed	-

Note: 1) See Section 7.1.

7.1 AC Powerline Conducted Emission

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Remarks : _____

7.1.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Min. Limit Margin (Average) _____ 3.7 _____ dB at _____ 0.414 _____ MHz

Uncertainty of Measurement Results _____ ± 2.6 _____ dB(2 σ)

Remarks : _____

7.1.2 Test Instruments

Shielded Room S2				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Test Receiver	ESCS 30	835418/005 (A-1)	Rohde & Schwarz	2016/04/01
Test Receiver	ESCI	100453 (A-42)	Rohde & Schwarz	2016/12/09
Spectrum Analyzer	FSL3	100229 (A-40)	Rohde & Schwarz	2016/04/25
AMN (main)	KNW-407FR	8-2019-1 (D-103)	Kyoritsu	2016/10/15
AMN (sub)	KNW-408	8-1402-2 (D-78)	Kyoritsu	2016/11/12
Terminator	65 BNC-50-0-1	--- (H-21)	HUBER+SUHNER	2016/10/15
RF Cable	RG223/U	--- (H-7)	HUBER+SUHNER	2016/11/19

NOTE : The calibration interval of the above test instruments is 12 months.

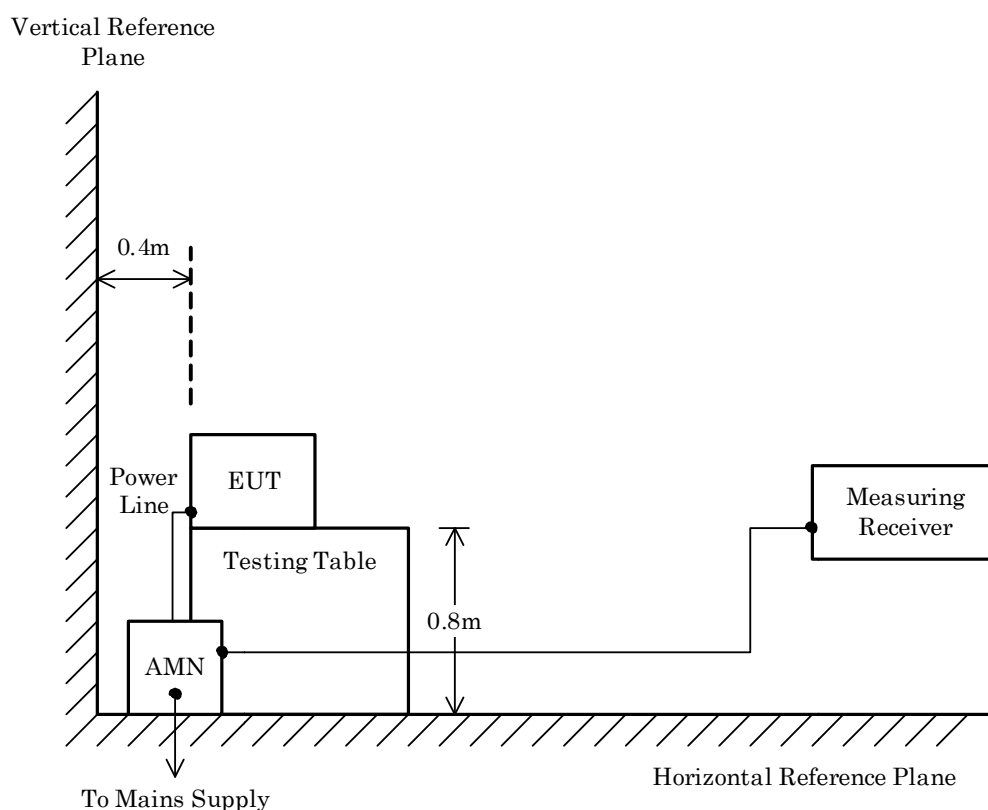
7.1.3 Test Method and Test Setup (Diagrammatic illustration)

The preliminary tests were performed using the scan mode of test receiver or spectrum analyzer to observe the emissions characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.

This configurations was used for final tests.

(Reference divisional instruction No. G703649)



NOTE

AMN : Artificial Mains Network

7.1.4 Test Data

Test voltage : 120VAC 60Hz

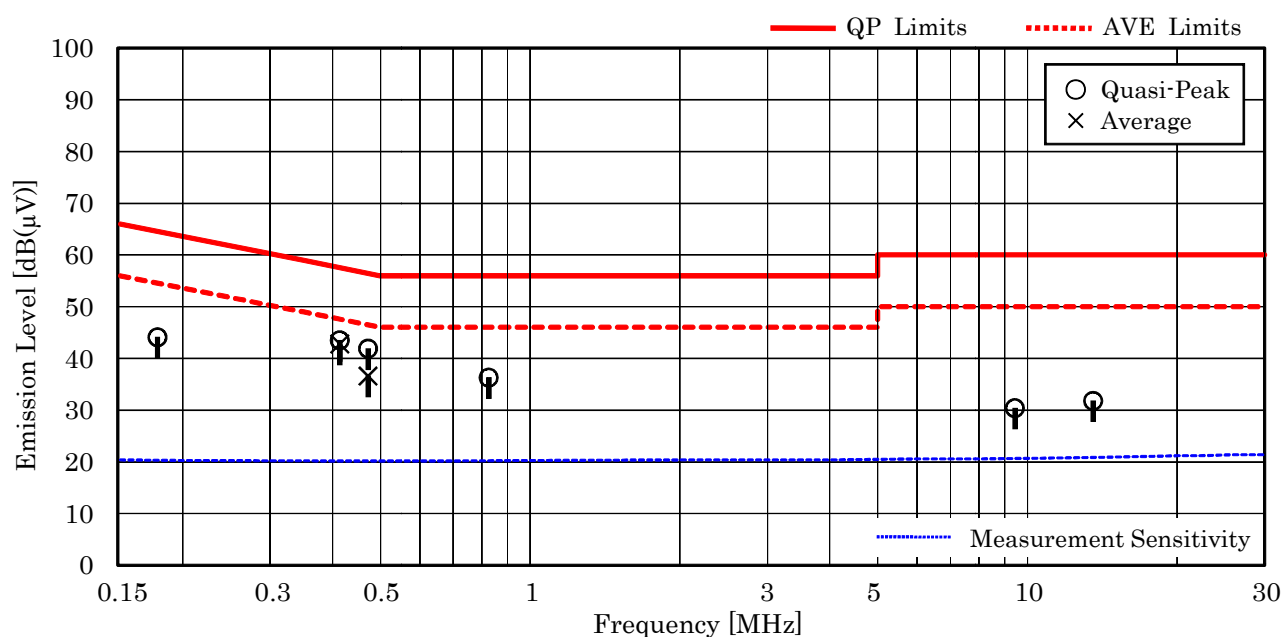
Test condition : Tx 13.56MHz Modulated

Measured phase : L1

Test Date: March 11, 2016

Temp.: 21 °C, Humi.: 32 %

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)]		Limits [dB(μV)]		Results [dB(μV)]		Margin [dB]		Remarks
		QP	AVE	QP	AVE	QP	AVE	QP	AVE	
0.178	10.3	33.8	--	64.6	54.6	44.1	--	+20.5	--	-
0.414	10.2	33.3	32.6	57.6	47.6	43.5	42.8	+14.1	+ 4.8	-
0.472	10.2	31.7	26.4	56.5	46.5	41.9	36.6	+14.6	+ 9.9	-
0.825	10.3	26.0	--	56.0	46.0	36.3	--	+19.7	--	-
9.436	10.7	19.7	--	60.0	50.0	30.4	--	+29.6	--	-
13.560	10.8	21.0	--	60.0	50.0	31.8	--	+28.2	--	-
27.120	11.4	< 10.0	--	60.0	50.0	< 21.4	--	> +38.6	--	-

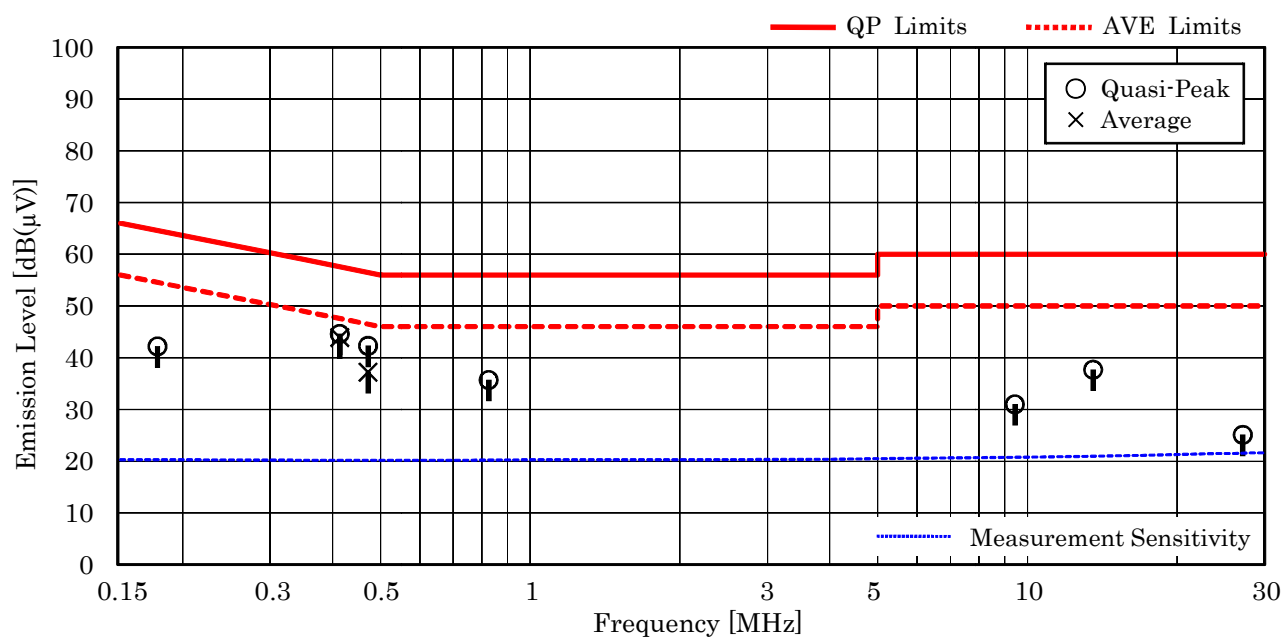


NOTES

1. The spectrum was checked from 150 kHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 0.414 MHz, as the worst point shown on underline:
Correction Factor + Meter Reading (AVE) = 10.2 + 32.6 = 42.8 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

Test voltage : 120VAC 60Hz**Test condition : Tx 13.56MHz Modulated****Measured phase : L2****Test Date: March 11, 2016****Temp.: 21 °C, Humi.: 32 %**

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)]		Limits [dB(μV)]		Results [dB(μV)]		Margin [dB]		Remarks
		QP	AVE	QP	AVE	QP	AVE	QP	AVE	
0.178	10.3	31.9	--	64.6	54.6	42.2	--	+22.4	--	-
0.414	10.2	34.4	33.7	57.6	47.6	44.6	43.9	+13.0	+ 3.7	-
0.472	10.2	32.1	27.0	56.5	46.5	42.3	37.2	+14.2	+ 9.3	-
0.825	10.3	25.4	--	56.0	46.0	35.7	--	+20.3	--	-
9.436	10.7	20.3	--	60.0	50.0	31.0	--	+29.0	--	-
13.560	10.9	26.8	--	60.0	50.0	37.7	--	+22.3	--	-
27.120	11.6	13.5	--	60.0	50.0	25.1	--	+34.9	--	-



NOTES

1. The spectrum was checked from 150 kHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 0.414 MHz, as the worst point shown on underline:
Correction Factor + Meter Reading (AVE) = 10.2 + 33.7 = 43.9 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

7.2 Radiated Emission

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.2.1 Test Results

7.2.1.1 Radiated Emission (§15.225(a)(b)(c))

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Min. Limit Margin (Quasi-Peak) 60.6 dB at 13.553 MHz

Uncertainty of Measurement Results 9 kHz – 30 MHz ± 3.0 dB(2σ)

Remarks : The Radited Emission at 30m of 13.553 MHz is -10.1 dB(uV/m).
Antenna Orientation: parallel

7.2.1.2 Radiated Emission (§15.225(d))

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Min. Limit Margin (Quasi-Peak) 6.4 dB at 203.40 MHz

Uncertainty of Measurement Results 9 kHz – 30 MHz ± 3.0 dB(2σ)

30 MHz – 300 MHz ± 3.8 dB(2σ)

300 MHz – 1000 MHz ± 4.8 dB(2σ)

Remarks : _____

7.2.2 Test Instruments

Anechoic Chamber A2				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Test Receiver	ESU 26	100170 (A-6)	Rohde & Schwarz	2016/04/25
Loop Antenna	HFH2-Z2	872096/25 (C-2)	Rohde & Schwarz	2016/07/26
RF Cable	RG213/U	--- (H-28)	HUBER+SUHNER	2016/07/26
Biconical Antenna	VHA9103/BBA9106	2355 (C-30)	Schwarzbeck	2016/05/24
Log-periodic Antenna	UHALP9108-A1	0694 (C-31)	Schwarzbeck	2016/05/24
Pre-Amplifier	310N	304573 (A-17)	SONOMA	2016/04/15
RF Cable	S 10162 B-11 etc.	--- (H-4)	HUBER+SUHNER	2016/04/15

NOTE : The calibration interval of the above test instruments is 12 months.

7.2.3 Test Method and Test Setup (Diagrammatic illustration)

7.2.3.1 Radiated Emission 9 kHz – 30 MHz

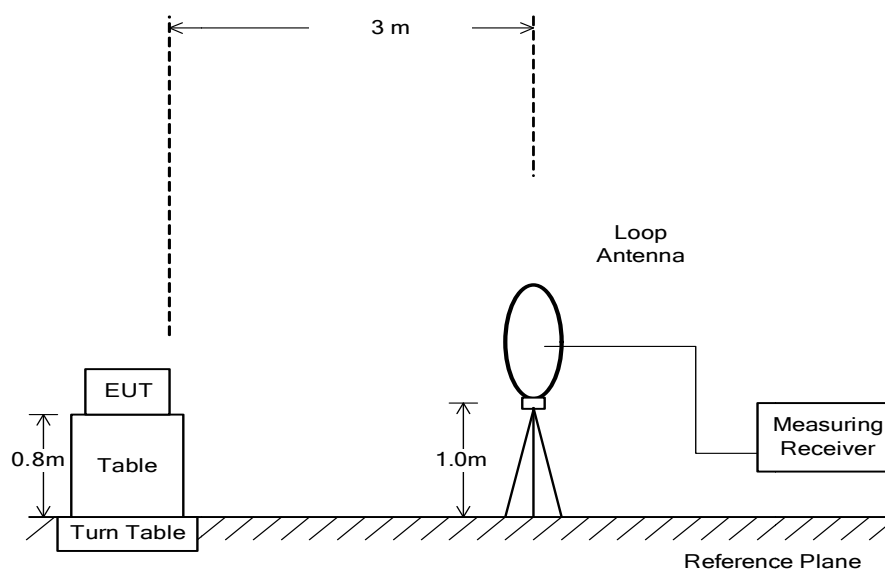
The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.

The measurement were performed about three antenna orientations (parallel, perpendicular, and ground-parallel).

This configurations was used for the final tests.

– Side View –



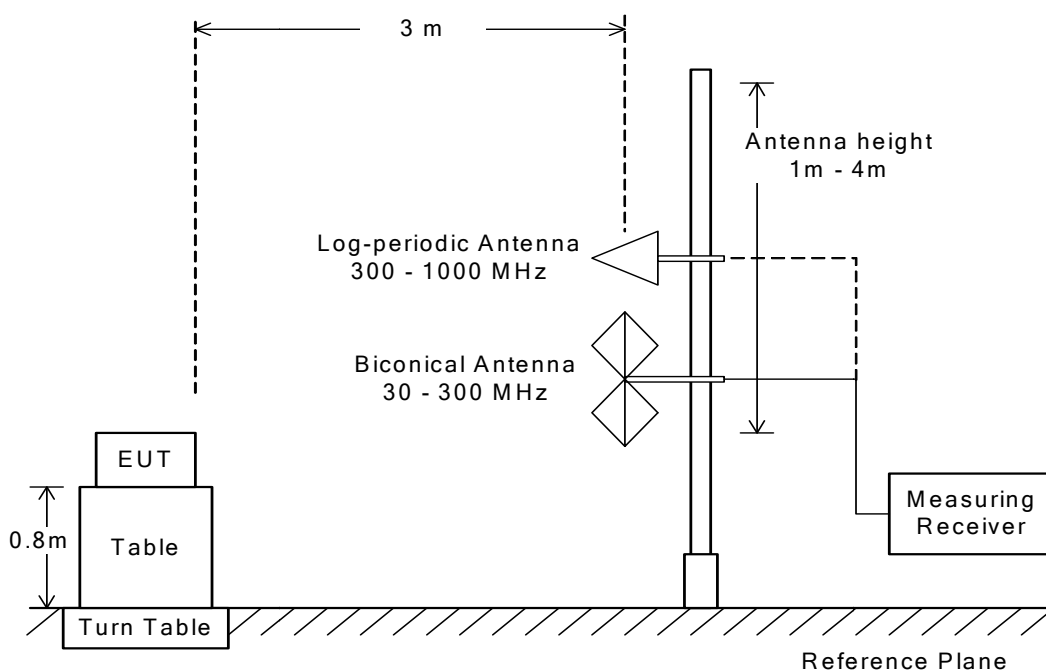
7.2.3.2 Radiated Emission 30 MHz – 1000 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.

This configurations was used for the final tests.

– Side View –



7.2.4 Test Data

7.2.4.1 Radiated Emission (§15.225(a)(b)(c) & §15.209(a))

Test condition : 13.56MHz Transmitting

Test Date: March 9, 2016

Temp.: 21 °C, Humi: 37 %

Frequency [MHz]	Correction Factor [dB(1/m)]	Meter Readings at 3 m [dB(μV)]	Limits [dB(μV/m)]	Specified Distance [m]	Extrapolated Results [dB(μV/m)]	Margin [dB]	Remarks
13.410	19.8	< 10.0	40.5	30.0	< -10.2	> +50.7	-
13.553	19.8	10.1	50.5	30.0	-10.1	+60.6	-
13.560	19.8	26.6	84.0	30.0	6.4	+77.6	-
13.567	19.8	< 10.0	50.5	30.0	< -10.2	> +60.7	-
13.710	19.8	< 10.0	40.5	30.0	< -10.2	> +50.7	-
27.120	22.2	< 10.0	29.5	30.0	< -7.8	> +37.3	-

NOTES

- Test Distance : 3 m
- The correction factor includes the antenna factor and the cable loss.
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- The testing loop antenna was rotated at the vertical and horizontal axis to maximize received emissions.
The above Meter Reading was maximum emission level.
- Calculation:
For fundamental, the measured field strength was extrapolated to distance 30m, using the formula that field strength using the formula that field strength aries as the inverse distance square(40 dB per decade of distance).

Fundamental : Correction Factor + Meter Reading = 19.8 + 26.6 = 46.4 dB(μV/m)
Result at 30 m = -40 + 46.4 = 6.4 dB(μV/m) (Conversion Factor : 40dB/decade)
Limits for 13.553-13.567MHz(§15.225(a)) = $20\log_{10}(15848) = 84.0$ dBμV/m
Limits for 13.410-13.553,13.567-13.710MHz(§15.225(b)) = $20\log_{10}(334) = 50.5$ dBμV/m
Limits for 13.110-13.410,13.710-14.010MHz (§15.225(c)) = $20\log_{10}(106) = 40.5$ dBμV/m
Harmonics : Correction Factor + Meter Reading = 22.2 + <10.0 = <32.2 dB(μV/m)
Result at 30 m = -40 + <32.2 = <-7.8 dB(μV/m) (Conversion Factor : 40dB/decade)
Limits for Harmonics(§15.209(a)) = $20\log_{10}(30) = 29.5$ dBμV/m
- Test receiver setting(s) :
Quasi-Peak Detector IF Bandwidth: 9kHz or 200Hz(Except for 9 kHz -90 kHz, 110 kHz -490 kHz)
Average Detector, IF Bandwidth: 9kHz or 200Hz(9 kHz -90 kHz, 110 kHz -490 kHz)
- Although AC power supply voltage was changed from 102 V to 138V, the emission level did not change.

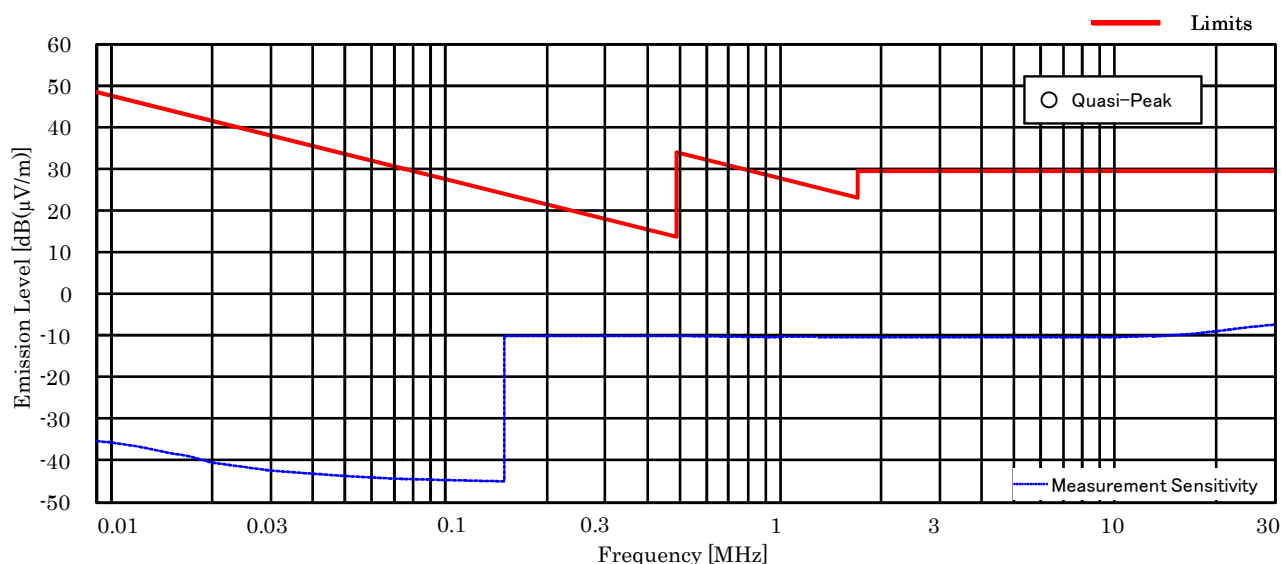
7.2.4.2 Radiated Emission (§15.209(a))(9kHz – 30MHz)

Test condition : 13.56MHz Transmitting

Test Date: March 9, 2016

Temp.: 21 °C, Humi: 37 %

Frequency [MHz]	Correction Factor [dB(1/m)]	Meter Readings at 3 m [dB(μV)]	Limits [dB(μV/m)]	Specified Distance [m]	Extrapolated Results [dB(μV/m)]	Margin [dB]	Remarks
0.009	29.6	< 15.0	48.5	300.0	< -35.4	> +83.9	-
0.01	28.8	< 15.0	47.6	300.0	< -36.2	> +83.8	-
0.05	21.2	< 15.0	33.6	300.0	< -43.8	> +77.4	-
0.10	20.3	< 15.0	27.6	300.0	< -44.7	> +72.3	-
0.50	19.8	< 10.0	33.6	30.0	< -10.2	> +43.8	-
1.00	19.7	< 10.0	27.6	30.0	< -10.3	> +37.9	-
5.00	19.6	< 10.0	29.5	30.0	< -10.4	> +39.9	-
10.00	19.6	< 10.0	29.5	30.0	< -10.4	> +39.9	-
20.00	20.9	< 10.0	29.5	30.0	< -9.1	> +38.6	-
30.00	22.5	< 10.0	29.5	30.0	< -7.5	> +37.0	-



NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 9 kHz to 30 MHz.
3. The correction factor includes the antenna factor and the cable loss.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 30.00 MHz, as the worst point shown on underline:
#VALUE!
#VALUE!
7. Test receiver setting(s) :
Quasi-Peak Detector, IF Bandwidth: 9kHz or 200Hz(Except for 9 kHz -90 kHz, 110 kHz -490 kHz)
Average Detector, IF Bandwidth: 9kHz or 200Hz(9 kHz -90 kHz, 110 kHz -490 kHz)

7.2.4.3 Radiated Emission (§15.209(a))(30MHz – 1000MHz)

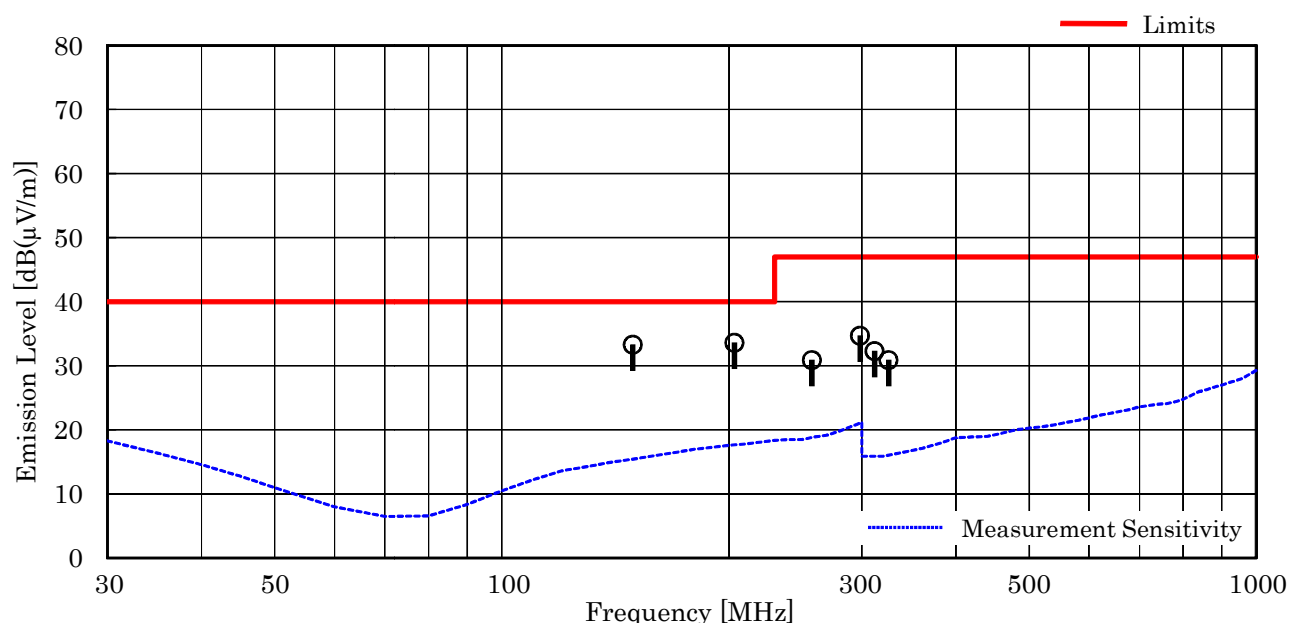
Test voltage : 120VAC 60Hz

Test Date: March 9, 2016

Temp.: 21 °C, Humi: 37 %

Antenna pole : Horizontal

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
149.16	14.7	-26.2	44.8	40.0	33.3	+ 6.7	-
203.40	16.5	-25.8	42.9	40.0	33.6	+ 6.4	-
257.64	17.2	-25.4	39.1	47.0	30.9	+16.1	-
298.35	19.3	-25.2	40.6	47.0	34.7	+12.3	-
311.88	14.0	-25.1	43.4	47.0	32.3	+14.7	-
325.44	14.1	-25.1	41.9	47.0	30.9	+16.1	-



NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of “<” means “or less”.
5. The symbol of “>” means “more than”.
6. Calculated result at 203.40 MHz, as the worst point shown on underline:
 Antenna Factor + Coorection Factor + Meter Reading = 16.5 + (-25.8) + 42.9 = 33.6 dB(μV/m)
 Antenna Height : 100 cm, Turntable Angle : 344 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

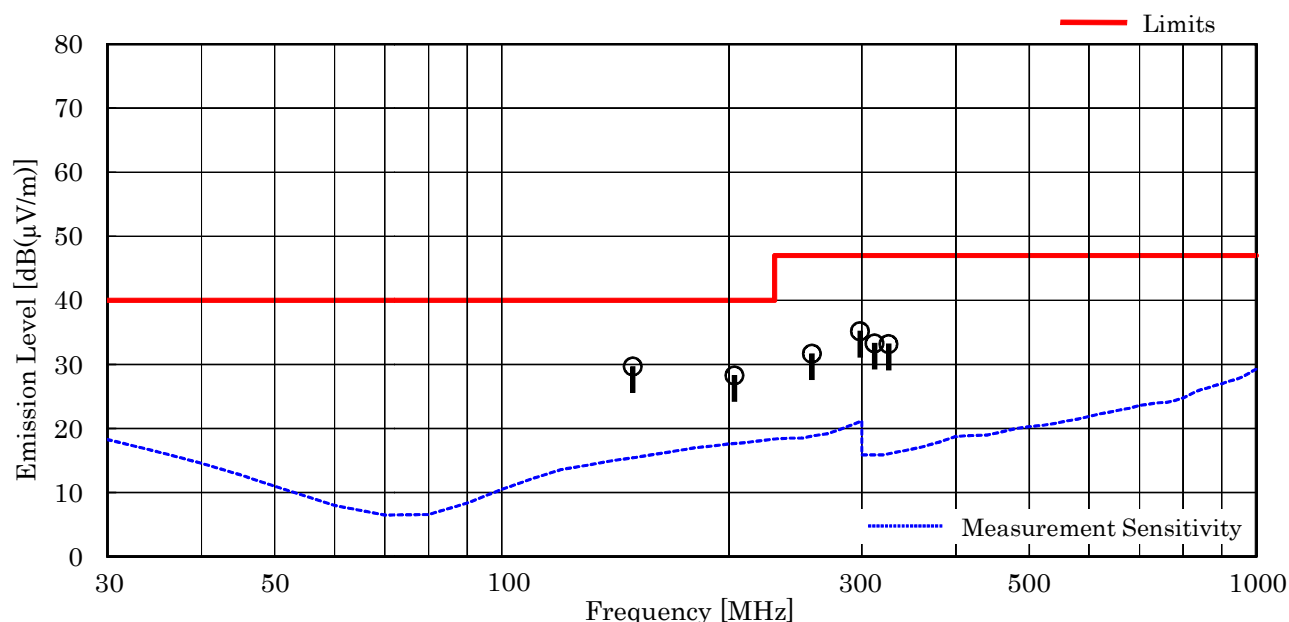
Test voltage : 120VAC 60Hz

Test Date: March 9, 2016

Temp.: 21 °C, Humi: 37 %

Antenna pole : Vertical

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
149.15	14.7	-26.2	41.2	40.0	29.7	+10.3	-
203.40	16.5	-25.8	37.6	40.0	28.3	+11.7	-
257.64	17.2	-25.4	39.9	47.0	31.7	+15.3	-
298.32	19.3	-25.2	41.1	47.0	35.2	+11.8	-
311.88	14.0	-25.1	44.4	47.0	33.3	+13.7	-
325.44	14.1	-25.1	44.2	47.0	33.2	+13.8	-



NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 149.15 MHz, as the worst point shown on underline:

$$\text{Antenna Factor} + \text{Coorection Factor} + \text{Meter Reading} = 14.7 + (-26.2) + 41.2 = 29.7 \text{ dB}(\mu\text{V/m})$$
 Antenna Height : 100 cm, Turntable Angle : 197 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

7.3 Occupied Bandwidth

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.3.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Uncertainty of Measurement Results ± 0.9 %(2 σ)

Remarks : _____

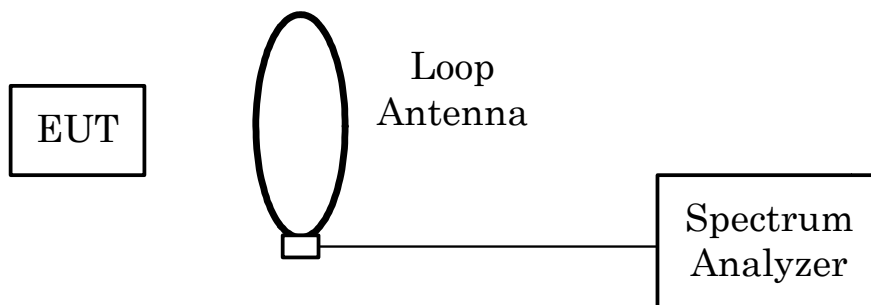
7.3.2 Test Instruments

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	FSL3	100229 (A-40)	Rohde & Schwarz	2016/04/25
Loop Antenna	LU-100A	--- (C-33)	TEXIO	N/A

NOTE : The calibration interval of the above test instruments is 12 months.

7.3.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



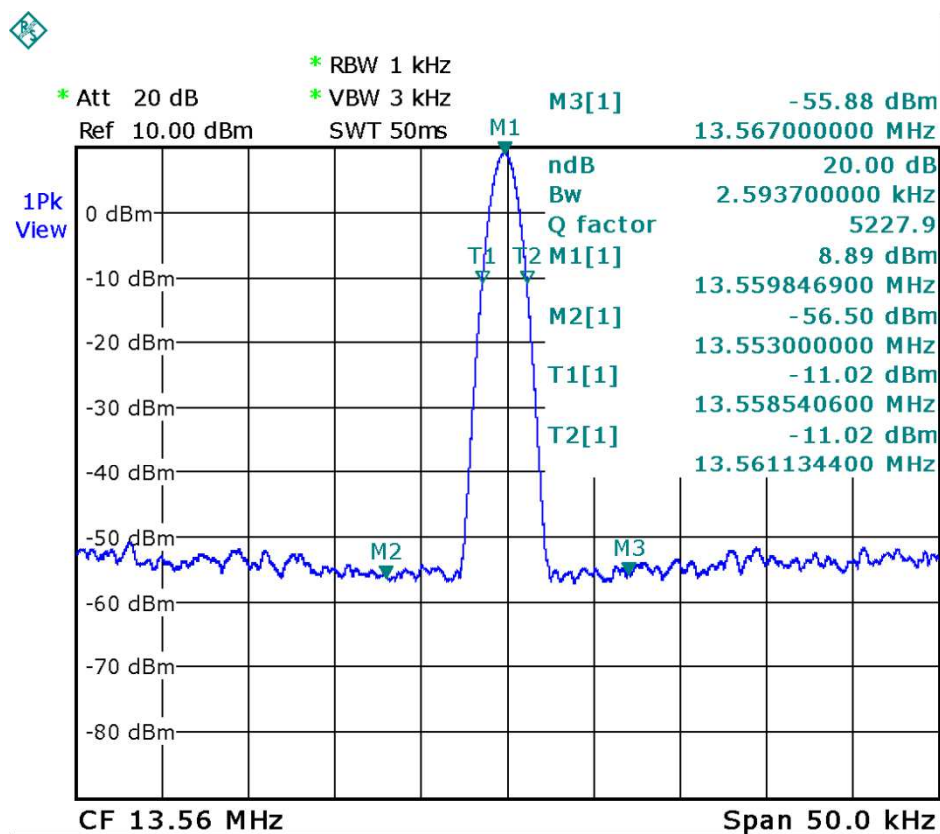
The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	1 kHz
Video Bandwidth	3 kHz
Span	50 kHz
Sweep Time	AUTO
Trace	Maxhold

7.3.4 Test Data

Test Date : March 17, 2016

Temp.: 20°C, Humi: 53%



7.4 Frequency Stability

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.4.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

The Frequency Stability level is -0.001881 % at 13.560 MHz

Min. Limit Margin +0.008119 % at 13.560 MHz

Uncertainty of Measurement Results ± 1.3 ppm(2σ)

Remarks : _____

7.4.2 Test Instruments

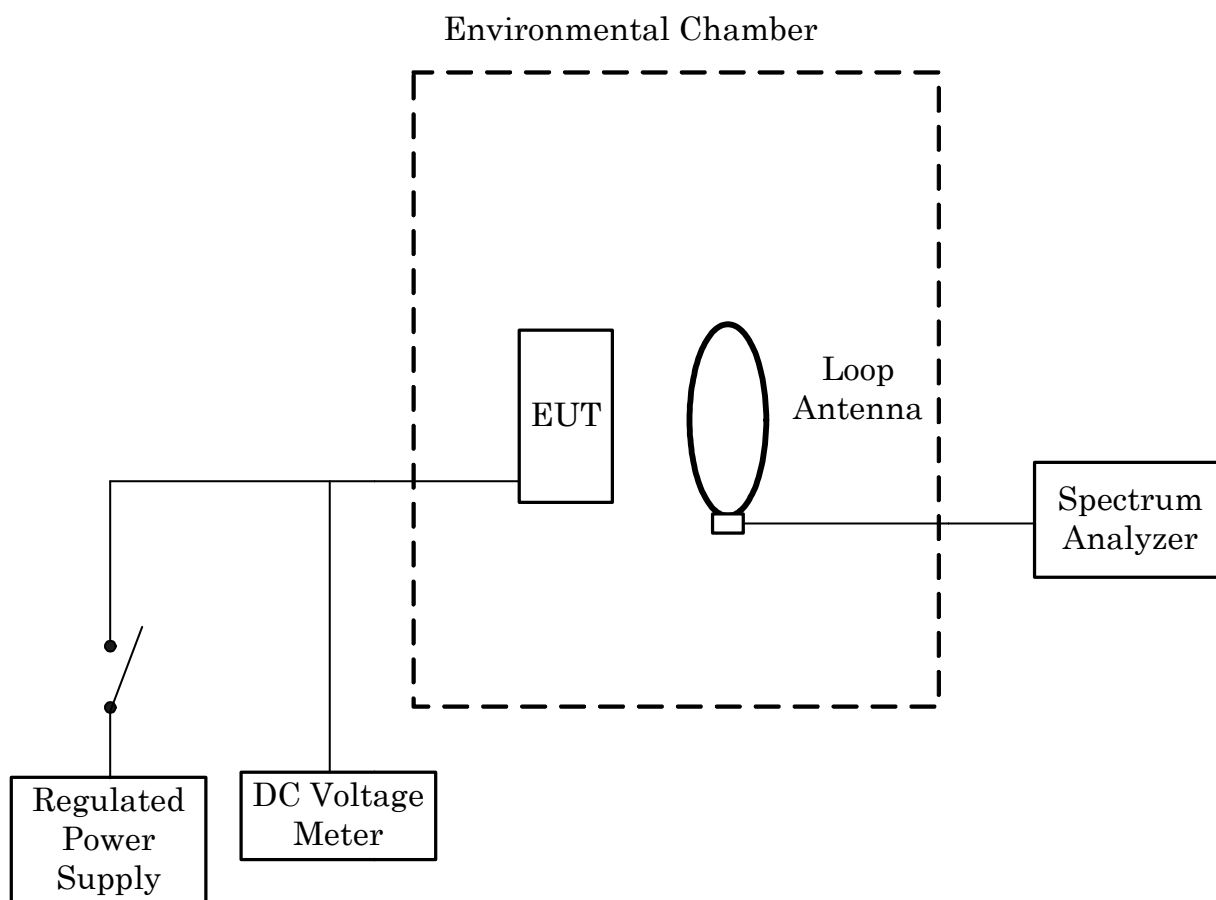
Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	FSL3	100229 (A-40)	Rohde & Schwarz	2016/04/25
Loop Antenna	LU-100A	--- (C-33)	TEXIO	N/A
Environmental Chamber	SH-641	92010990 (F-32)	ESPEC	2016/07/06

NOTE : The calibration interval of the above test instruments is 12 months.

7.4.3 Test Method and Test Setup (Diagrammatic illustration)

Frequency Stability versus Temperature

The EUT was placed in an environmental chamber and was tested in the range from -30 to $+50$ degrees Celsius. The EUT was stabilized at each temperature. The power (4.0VDC) supplied was applied to the transmitter and allowed to stabilize for 10 minutes. The transmitting frequency was measured at startup and 2 minutes, 5 minutes and 10 minutes after startup. This procedure was repeated from -20 , $+20$ and $+50$ degrees Celsius.



7.4.4 Test Data

Frequency Stability Measurement

Test Date: March 17, 2016

Transmitting Frequency : 13.560 MHz
 AC Supply Voltage : 120.0VAC 60Hz

Ambient Temperature [°C]	Startup	Frequency with time elapse[MHz]			Limits [%]	Margin [%]
		2 minutes	5 minutes	10 minutes		
-20	13.559918	13.559911	13.559906	13.559889		
20	13.559835	13.559826	13.559825	13.559827		
50	13.559756	13.559745	13.559746	13.559747		
Ambient Temperature [°C]	Startup	Diviation with time elapse[%]			Limits [%]	Margin [%]
		2 minutes	5 minutes	10 minutes		
-20	- 0.000605	- 0.000656	- 0.000693	- 0.000819	0.01	+ 0.009181
20	- 0.001217	- 0.001283	- 0.001291	- 0.001276	0.01	+ 0.008709
50	- 0.001799	- 0.001881	- 0.001873	- 0.001866	0.01	+ 0.008119

Transmitting Frequency : 13.560 MHz
 Ambient Temperature : 20 [°C]

AC Supply Voltage	Startup	Frequency with time elapse[MHz]			Limits [%]	Margin [%]
		2 minutes	5 minutes	10 minutes		
108VAC 60Hz	13.559845	13.559847	13.559857	13.559873		
138VAC 60Hz	13.559913	13.559909	13.559892	13.559868		
AC Supply Voltage	Startup	Diviation with time elapse[%]			Limits [%]	Margin [%]
		2 minutes	5 minutes	10 minutes		
108VAC 60Hz	- 0.001143	- 0.001128	- 0.001055	- 0.000937	0.01	+ 0.008857
138VAC 60Hz	- 0.000642	- 0.000671	- 0.000796	- 0.000973	0.01	+ 0.009027

Sample of calculated result at 13.560 MHz, as the Minimum Margin point:

Ambient Temperature : 50 °C / 2 minutes

AC Supply Voltage 120VAC 60Hz

Minimum Margin: $0.010000 - 0.001881 = 0.008119$ (%)

The point shown on “ ” is the Minimum Margin Point. The Maximum Deviation Point is shown on a thick letter.

Note: The measurement were made after all of components of the oscillator sufficiently stabilized at each temperature.

7.5 Test Setup (Photographs)

7.5.1 AC Powerline Conducted Emission



– Front View –



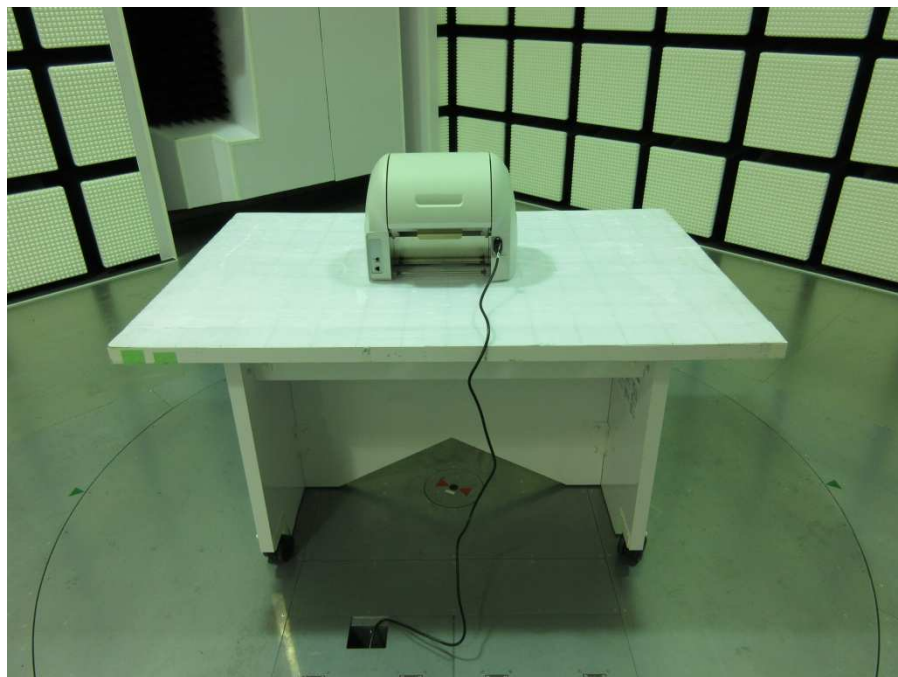
– Side View –

Photograph present configuration with maximum emission

7.5.2 Radiated Emission



– Front View –



– Side View –

Photograph present configuration with maximum emission